

generally turned into lawns with flower beds and perhaps a fountain. No doubt, the sanitary conditions imposed have much to do with this, but the result is none the less in good taste. We cannot avoid, however, a stray shot at the ugly standpipe with conical cap, sometimes seen in our smaller towns. This is unnecessary. When enclosed it has been made an interesting object, and even the bare pipe can be ornamented in such a way as to relieve its nakedness.

There is much encouragement in the growing appreciation and enjoyment of public parks and boulevards. Cities and towns all over the land are trying to beautify what they already have and are adding new territory to their park resources. Admirable skill has been shown in utilizing the natural features of the local landscape, the rocks, tree masses, meadows, ravines, ponds and streams, the wide expanse of ocean or glimpses of bright water. The curving roads and paths, with undulating gradients, have a beauty of their own and lead one from point to point of the ever-changing scene, and yet bind it all into one harmonious whole. While the landscape engineer deserves credit, not so much praise can be given park commissioners for the artificial adornments which they have added to his work. Notwithstanding the fact that these are sometimes labeled as artistic, they do not always fit in appropriately.

The writer firmly believes that there is a latent æsthetic quality in American life that is now struggling to find both means for its gratification and methods of expression. Before there can be knowledge of its meaning and power there must be many attempts and many failures. The whole process is one of education and that largely in the school of experience. This applies to the industrial and constructive arts as well as to the fine arts. The engineer will share in the general movement, but this is

not enough. As a designer of so much that the world needs for daily use he must do more than keep up; he must keep in advance. He must not only have a capacity to enjoy, but also the power to originate and apply. To this end he must give preliminary study and thought to the principles of æsthetic design, so gaining an intellectual knowledge of them. American engineering schools are doing little or nothing to help the young engineer to this. So far as the writer knows, there is but one American text-book, Prof. Johnson's book on bridges, that includes any discussion of the matter. A course of study in engineering æsthetics near the close of college life would be a great help and stimulus to a young graduate, at least opening his eyes to the fact that there was such a thing. After knowledge comes the application of principles as tests to an engineer's own work and to that of other men. And, finally, with theoretical and practical knowledge well in hand and a love of what is beautiful, comes the impulse to work artistically. With such engineers and an appreciative clientele American engineering would be artistic. To this end let us work.

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GEOLOGICAL MYTHS.*

MANY years ago I visited the British flagship 'Bellerophon' in the harbor of Bermuda, and was told that when the ship was first named the sailors wrestled with the sonorous but unmeaning name, and quickly transformed it into 'Billy-ruffian,' and it became at once intelligible, and belligerent, and satisfying.

There arose, however, a contest in the fore-castle as to whether 'Billy-ruffian' or 'Bully-ruffian' was the correct thing; certain rude fellows of the baser sort wish-

* Address of the Vice-President before Section E, Geology and Geography.

ing to have the word pugnacious in both its proximal and distal extremities.

This illustrates the principle of attraction in language whereby words without meaning to the users tend to be modified into forms which at least appear intelligible.

It is said that when asparagus was introduced into England the peasants immediately called it 'sparrow-grass,' and went on to explain the reason it was called sparrow-grass was because the sparrows ate the red berries.

This illustrates the second step of the process. The word is first attracted into a form which has a meaning, and in its turn this meaning requires a justification, and thus the meaning itself quickly suggests.

The peasant was not disturbed by, or did not observe, the fact that the sparrows do not eat the red berries. This would have been to have risen to the 'verification of hypothesis'—an indefensible encroachment on the terrain of the British philosopher.

I propose to trace the history of several myths which have their origin in remarkable geological phenomena, for I hardly need to say that I do not use the word myth in the modern fashion of newspaper English, as a false report, a canard, in short, a newspaper story; but as meaning a history, treasured and hallowed in the literary and religious archives of an ancient folk, of some startling or impressive event, that, in the stimulating environment of poetry and personification, has completed a long evolution, which disguises entirely its original,—

"Has suffered a sea-change
Into something new and strange,"

so that, in fact, its study is paleontological.

I propose to speak of the Chimæra, or the poetry of petroleum; of the Niobe, or the tragic side of calcareous tufa; of Lot's wife, or the indirect religious effect of cliff erosion, and of Noah's flood, or the possibilities of the cyclone and the earthquake wave working in harmony.

THE CHIMÆRA.

The myth of the Chimæra is told, in its earliest form, in a quaint old translation of Hesiod, who, according to the Marbles of Paros, lived about nine centuries before the Christian Era.

"From the same parents sprang Chimæra dire,
From whose black nostrils issued flames of fire;
Strong and of size immense; a monster she
Rapid in flight, astonishing to see;
A lion's head on her large shoulders grew,
The goats and dragons terrible to view;
A lion she before in mane and throat,
Behind a dragon, in the midst a goat;
Her Pegasus the swift subdued in flight
Backed by Bellerophon, a gallant knight,
From Orthus and Chimæra, foul embrace,
Is Sphinx derived, a monster to the race."

The same story is told a little later by Homer* with more grace of diction.

"And Glaucus in his turn begot
Bellerophon, on whom the gods bestowed
The gifts of beauty and of manly grace.
But Proetus sought his death; and mightier far,
From all the coasts of Argos drove him forth.

* * * * *

To Lycia, guarded by the gods, he went;
But when he came to Lycia and the stream
Of Xanthus, there with hospitable rites
The king of wide-spread Lycia welcomed him.
Nine days he feasted him, nine oxen slew;
But with the tenth return of rosy morn
He questioned him and for the tokens asked
He from his son-in-law, from Proetus bore
The token's fatal import understood,
He bade him first the dread Chimæra slay,
A monster sent from heav'n—not human born,
With head of lion and a serpent's tail,
And body of a goat, and from her mouth
There issued flames of fiercely-burning fire.
Yet her, confiding in the gods, he slew.
Next with the valiant Solymi he fought
The fiercest fight he ever undertook;
Thirdly the women-warriors he overthrew,
The Amazons."

It will be seen here that Bellerophon, like Hercules or St. George, is a professional wandering slayer of dragons. His

*Iliad., VI., 180; Earl Derby's Translation, VI., 184-216.

name from *βάλλω*, the far-throwing rays of the sun, shows him to be a type of the wide-spread sun-myth, whose rising rays strike down the forms of darkness.

But the myth of Chimæra is independent of him, and is always localized; there is always the tail of a dragon, the body of a goat and the head of a lion, or the three heads of lion, goat and serpent, and it vomits fire, and ravages in the mountains of woody Lycia.

The classical prose writers describe the phenomenon with curious accuracy. Seneca says:

"In Lycia regio notissima est.
Ephestion incolæ vocant,
Perforatum pluribus locis solum,
Quod sine ullo nascentium damno ignii in-
noxius circuit.
Laeta itaque regio est et herbida nil flammis
adurentibus."

(In Lycia is a remarkable region, which the inhabitants call Ephestion.* The ground is perforated in many places; a fire plays harmlessly without any injury to growing things. It is a pleasant region, therefore, and woody, nothing being injured by the flames.)

Strabo says, simply: "The neighborhood of these mountains is the scene of the fable of the Chimæra, and at no great distance is Chimæra, a sort of ravine, which extends upward from the shore." And Pliny, with his accustomed mingling of truth and fiction, says: "— et ipsa (Chimæra sæpe flagrantibus jugis" (and Chimæra itself with its flaming peaks). And again: "Flagrat in Phaselide Mons Chimæra et quidem immortalibus diebus ac noctibus flammâ." (Mount Chimæra burns in Phaselis, with a certain immortal flame shining by day and by night.) Also: "In the same country of Syria the mountains of Hephestius, when touched with a flaming torch, burn so violently that even the

* That is Vulcan.

stones in the river and the sand burn while actually in the water. This fire is also increased by rain. If a person make furrows in the ground with a stick which has been kindled at this fire, it is said that a stream of flame will follow it."

Servius, the ancient commentator of Virgil, explains the myth as follows: "The flames issue from the summit of the mountain, and there are lions in the region under the peak, the middle parts of the hill abound with goats, and the lower with serpents." While the modern commentators say: "The origin of this fire-breathing monster must be sought probably in the volcano of the name of Chimæra in Phaselis, in Lycia,"* and the myth did not escape the great, but largely wasted, erudition of Knight, who says: "In the gallery in Florence is a colossal image of the Phallus, mounted on the back parts of a lion, and hung round with various animals. By this is represented the cooperation of the creating and destroying powers, which are both blended and united in one figure, because both are derived from one cause. The animals hung round show also that both act to the same purpose, that of replenishing the earth, and peopling it with still rising generations of sensitive beings. The Chimæra of Homer, of which the commentators have given so many whimsical interpretations, was a symbol of the same kind, which the poet, probably having seen in Asia, and not knowing its meaning (which was only revealed to the initiated), supposed to be a monster that had once infested the country. He described it as composed of the forms of the goat, the lion and the serpent, and breathing fire from its mouth, (Il. V., 233). These are the symbols of the creator, the destroyer and the preserver, united, and animated by the fire, the divine essence of all three.

"On a gem published in the Memoirs of

* Smith's Dict. of Clas. Antiq. Sub. Chimæra.

the Academy of Cortona this union of the destroying and preserving attributes is represented by the united forms of the lion and the serpent crowned with rays, the emblems of the cause from which both proceed. This composition forms the Chnoubis of the Egyptians."*

And thus the matter rested until, in the end of the last century, Admiral Beaufort,† while anchored off Lycia on hydrographic work, saw each night a strong flame on the peak of a mountain a few miles back from the coast, and was told by the inhabitants that it had always burned there.

He visited the place, and found flames of natural gas issuing from a crevice on a mountain of serpentine and limestone.

In 1842 Spratt and Forbes ‡ report as follows on the locality: Near Ardrachan, not far from the ruins of Olympus, a number of serpentine hills rise among the limestones, and some of them bear up masses of that rock. At the junction of one of these masses of scaglia with the serpentine is the Yanar (or Yanardagh), famous as the Chimæra of the ancients, rediscovered in modern times by Captain Beaufort. It is nothing more than a stream of inflammable gas issuing from a crevice, such as is seen in several places among the Apennines. The serpentine immediately around the flame is burned and ashy, but this is only for a foot or two; the immediate neighborhood of the Yanar presenting the same aspect it wore in the days of Seneca, who writes "*Læta itaque regio est et herbida, nil flammis adurentibus.*"

Such is the Chimæra, 'flamisque armata Chimæra,' § deprived of all its terrors. It is still, however, visited as a lion by both Greeks and Turks, who make use of its

classic flames to cook kabobs for their dinner.

In 1854 it was visited by the Prussian painter, Berg, who has reproduced the scene in a fine painting now in Berlin.* The flame which he says, gives the odor of iodine, is three or four feet high. Several extinct openings were found in a pool of sulphurous water.

The Austrian geologist, Tietze,† found the flame two feet across, and a smaller one adjacent. The ruins of an ancient temple of Vulcan, near by and of a late Byzantine church, show how strongly it has impressed the inhabitants in all ages.‡

The natural phenomenon of a spring which is found by historic documents to have been burning for nearly three thousand years is sufficiently striking, although the slow escape of such gas from Tertiary limestones is not uncommon. The mention of sulphurous waters in the neighborhood may justify us in going back to the same antiquity and drawing from the remark of Theophrastus (*Περὶ τῶν λίθων*) on the oxidation of pyrite in contact with bitumen, an explanation of the constant ignition of the gas.

Theophrastus says: "That, also, which is called Epinus (or Spelus) is found in mines. This stone cut in pieces and thrown together in a heap exposed to the sun, burns, and that the more if moistened or sprinkled with water."

We may of course assume the more prosaic spontaneous combustion of the volatile hydrocarbons to explain the constant rekindling of the sacred fires.

It remains to consider how the myth and its name arose. The mountain is still called Yanar-dagh, the burning mountain, and in a learned work on coins of Sicily, which

* Richard Payne Knight. Discourse on the Worship of Præp, p. 73.

† Beaufort's Karamania, 35, 52, 85.

‡ Travels in Lycia, II., 181, 1847.

§ Virgil, Æneid, VI., 288.

* Zeitschrift, All. Erdkunde, III., 307.

† Beiträge, zur Geologie Lykien. Jahrbuch d. K. K. Geol. Reichsanstalt, XXXV., 353.

‡ C. Ritter, Erdkunde, Theil. 19, 751.

reproduces the Chimæra, M. Streber derives the name from the Phœnician word Chamirah, which means the burning mountain.

But the Greek word *χαιρα* means a goat, and has almost the same sound, and we can see clearly how, as the Greek settlements spread over Lycia, from the north, the meaningless Phœnician names were retained like the Indian names in America, and how the story slowly went back to the fatherland—*et crescit eundo*—of a strange mountain called Chamira, from which portentous flames escaped, and then of a monster Chimæra, of goat-like form, vomiting flames and ravaging in the mountains of woody Lycia. And so the story was finally fitted for the manipulation of the poets, who little thought they were making the stout Belerophon run a quixotic tilt against a burning gas well.

THE NIOBE.

Like the Chimæra, the Niobe is an episode in Greek mythology, easily separated from the rest without disturbing the Greek Pantheon. I do not need to describe the great group of the Niobe, the mother weeping over her children, who fall before the shafts of Apollo, which adorns the gallery of the Uffizi at Florence, and forms one of the masterpieces of Greek sculpture, the glory of Scopas or Praxiteles. I do not need to recall the story as told by Homer, how Niobe, the daughter of Tantalus, proud of her twelve children, despised Latona, who had but two; how, therefore, Phœbus and Artemis slew all the twelve with their arrows:

"They lay unburied on the plain for nine days, when Zeus changed them to stone, and on the tenth day the heavenly gods buried them. And now, upon arid Sipylus, upon the rocks of the desert mountain, where, they say, are the couches of the divine nymphs, who dance upon the banks of Achelous, Niobe, though turned to stone,

still broods over the sorrow the gods have sent upon her."

And Ovid says:

"She weeps still, and borne by the hurricane of a mighty wind,
She is swept to her home, there fastened to the cliff of the mount,
She weeps, and the marble sheds tears yet even now."

As one climbs from the Gulf of Smyrna, between Mount Tmolus and Sipylus, up the rich valley of the Nif, or Nymphio, there appears, high up in the vertical wall of limestone, the colossal bust of a woman standing on a high pedestal and in a deep alcove. It is cut out of the living rock, like the Swiss lion at Lucerne.

A recess twenty-five feet high and sixteen feet wide has been cut in the rock for the lower part, and a smaller alcove of much greater depth surrounds the bust itself. All the face of the rock around is smoothed, and a broad ledge is cut around the pedestal to receive the offerings of the ancient Phœnician worshippers of this almost prehistoric statue of the great Mother Cybele, or of Meter Sipylene; gods of the Phœnicians.

From the valley below it makes the impression of a full-length statue with flowing robes, but near at hand the robes are seen to be the very tears of Niobe, formed where the drip of the waters from the limestone roof of the alcove has first struck her cheeks, and running down across her breast has made rippling surfaces of bluish tufa, which has all the effect of tears.

The statue had been greatly corroded, and the stalagmite tears had formed already in the days of Pausanias, who says: "When standing close to it the rocks and precipice do not show to the beholder the form of a woman, weeping or otherwise, but if you stand farther back, you think you see a woman weeping and sad."

And even in the times of Homer the mem-

ory of the earlier and vanished worshippers was at best a dim tradition, and the facile imagination of the Greeks had built up the whole beautiful legend, every element of the surrounding scenery adding its portion of suggestion, and it is marvellous how all parts of the story still linger in the valley.

As the grand missionary, artist and geologist, van Lennep, from whom I have obtained most of this account,* who in all his travels in Asia Minor collected carefully and labelled carefully, and sent valuable material to his Alma Mater, Amherst, was climbing to the statue, his guide, a cake-seller by the roadside, said: "There is a tradition that this statue was once a woman, whose children were killed, and she wept so that God changed her to stone. They say that her tears make a pond down there, and still keep it full."

All the people of the region, ignorant and learned, agree in this, while all travellers have called this the statue of Cybele.

Their name for the valley, Nif, is a corruption of Nymphio, as Homer says, 'the couches of the divine nymphs.' Sipylus, the name of the mountain to this day, was also the name of the oldest son of Niobe.

Niobe was the daughter of Tantalus. Tantalus, from *ταλαντεύω*, to balance, is a rock poised in the air, an allusion to the ledges overhanging the statue, and threatening to fall and crush it.

That she is the mother of many children may be a reminiscence from Cybele, the All-mother, and the mention of the couches of the divine nymphs seems to suggest some ancient nature worship of the valley. The children slain by the arrows of Phœbus are the masses of rock dislodged from the cliffs around her by the action of sun and rain and forming the great talus at the foot of the bluff.

"They lie unburied on the plain," Homer tells us, "till on the tenth day the heavenly

*Asia Minor, II., 300. London, John Murray, 1870.

gods bury them," as the fallen rock quickly disintegrates under the influence of the weather in this warm climate. The Greek word, Niobe, connects itself with the pouring of water and the falling of snow (*νίζω* *νίπτω* and *νίφω*), so a Greek impersonation of the drip from the marble cliff upon the ancient rock sculpture might easily have acquired the name of Niobe, the weeping one.

"It seems, thus," says van Lennep, "that this sculpture was executed in a very remote antiquity, to represent Cybele, the mother of the gods, or some form of nature-worship, that the water drip from the rock above gave it, from the first, the same striking watermark which it still bears, maintained by the same cause, and that this appearance suggested to the lively imagination of the Greek the whole myth of Niobe—her tears, her sorrows, her strange transformation, her perpetual weeping; so this most ancient statue is not an image sculptured to represent this story of Niobe, but is itself the very original from which the story sprung." It is thus an impressive testimonial of the vast importance of the loose bond by which the second molecule of CO₂ is held combined in calcic bicarbonate.

LOT'S WIFE.

Looking down on that most marvellous of all lakes—the Dead Sea, the Lacus Asphaltites of the Romans—the sea of Lot of the Arabs, still stands the great column of salt into which Lot's wife was changed.

"She was changed into a pillar of salt," says Josephus, "for I have seen it, and it remains to this day."

And Irenæus explains how it came to last so long with all its members entire, because "when one was dissolved it was renewed by miracle." It was, in fact, the geological miracle of erosion.

The column looks down from the plain of Sodom, and on the great southern bay

of the sea, ten miles square, and but one or two feet deep, where sulphur, deposited by many hot springs, is abundant in the clay, and where bitumen oozes from every crevice of the rock, and every earthquake dislodges great sheets of it from the bottom of the lake, where the Arabs still dig pits for the 'stone of Moses' to gather in, and sell it in Jerusalem, and where, in that most ancient fragment of the Pentateuch, four kings fought against five, and the kings of Sodom and Gomorrah slipped in the slime-pits and fell. One who has read of the burning of an oil well or Oil Creek, or in Apscheron will have a clear idea of the catastrophe which overtook the cities of the plain where the Lord rained upon Sodom and upon Gomorrah brimstone and fire out of Heaven.

Following the latest extremely interesting researches of Blankenkorn,* we may picture the upper cretaceous plateau of Judea—an old land, cleft at the end of the Tertiary by many faults, between which a great block sank to form the bottom of this deep sea. It carried down in the fossiliferous and gypsum-bearing beds the source of the bitumen and the sulphur. We may picture the waters standing much higher than now during the pluvial period, which matched the northern glacial period, rising nearly to the level of the Red Sea, but never joining it. In the succeeding arid interglacial period, the time of the steppe fauna in Europe, the sea shrank to within a hundred meters of its present level, and deposited the great bed of rock salt which underlies the low plateaus around its southern end. The advent of the second glacial period was here the advent of a second pluvial period, which swelled the waters and carried the bitumen-cemented conglomerates over the salt beds to complete the

low plateau. After the second arid period with some lava flows, and a third pluvial period with the formation of a lower and broader terrace, the waters shrank to the present saturated biterms in the present arid period. In the earlier portion of this last or post-glacial stadium, a final sinking of a fraction of the bottom of the trough, near the south end of the lake, dissected the low salt plateau, sinking its central parts beneath the salt waters, while fragments remain buttressed against the great walls of the trench forming the plains of Djebel Usdum and the peninsula El Lisan, with the swampy Sebcha between. Imagine a central portion of one of the low plains which extend south from the 'Finger Lakes' to sink, submerging Ithaca or Havana in a shallow extension of the lake waters. It exposed the wonderful eastern wall of Djebel Usdum, seven miles long, with 30–45 m. of clear blue salt at the base, capped by 125–140 m. of gypsum-bearing marls impregnated with sulphur, and conglomerates at times cemented by bitumen. It was this or some similar and later sinking of the ground, at the time when geology and history join, which, with its earthquakes, overthrew the cities of the plain and caused the outpour of petroleum from the many fault fissures and the escape of great volumes of sulphurous and gaseous emanations, which, ignited either spontaneously, by lightning or by chance, furnished the brimstone and fire from heaven, and the smoke of the land going up as the smoke of a furnace which Abraham saw from the plains of Judea.

But with Lot's wife the case is different. The bed of salt out of which she was carved, and has been many times carved, was exposed by the very catastrophe which destroyed the cities; and Lot fled to Zoar in a direction opposite to that in which the salt bed lies. As Oscar Fraas found his Arabs calling the salt pyramid 'Lot's col-

* Dr. Max Blankenkorn, *Entstehung und Geschichte des Todten Meers*. Zeit. Deutsch. Palestina-Vereins, vol. xix., p. 1, 1896.

umn,' so, in early times, when the tradition of the burning cities was gradually growing into the myth of Sodom and of Lot, some old name of the salt column, grown meaningless, may have had such sound as to suggest the term, 'Lot's wife'—Bint Sheck Lut, or the woman's own name in the current language, as Chamirah, the burning mountain, suggested Chamæra, the goat, and the answer to the question why was the salt column called Lot's wife was quickly given and woven into the legend. In that dry climate successive erosions have reproduced it along the seven-mile ridge of salt, still called Kashum Usdum, or Sodom.

THE FLOOD.

Only through an exegesis of the German words Alluvium and Diluvium would the young geologist be reminded of the time when the Flood was a burning question in geology, an igneo-aqueous question, so to speak; when commentaries explained the fossil shells in the Apennines as due to Noah's Flood, and Voltaire tried to break the force of this important proof of the truth of the Bible by declaring these shells to be the scallop-shells thrown away by expiring pilgrims of the Crusades; when Andreas Scheuzer apostrophized his fossil salamander ('Homo diluvii testis et theoscopos'):

"Betäubtes Beingerüst von einem alten Sünder
Erweiche Stein und Herz der neuen Bösheitskin-
der."

This ancient sinner's scattered and dishonored bones
Should touch the stony hearts of modern wicked ones.

It was thus a great surprise when one of the most powerful and philosophical works of the century on geology, 'Die Ansicht der Erde,' of Suess, had as its opening chapter an explanation of the Flood as due to a coincidence of a cyclone and an earthquake at the mouth of the Euphrates. The Biblical account is plainly exotic, told by a people ignorant of sea-faring—a fresh-water

account of a salt-water episode. The description of the vessel as a box or ark, the going in and shutting the doors, and the opening of the windows, remind one of a house-boat and indicate the adaptation of the story to the comprehension of an inland people. Its minor discrepancies and blending of the Jahvistic and Elohist elements show the story has come by devious courses from a distant source.

The account of the Chaldean priest, Berosus, 250 B. C., located the occurrence at the mouth of the Euphrates, where the native boatman still pitches his boat within and without with pitch, as the ark was pitched.

Berosus, priest of Bel, quoted by Alexander Polyhistor, says that the Flood occurred under the reign of Xisuthros, son of Otiartes. Kronos announces to Xisuthros, in a dream, that on the fifteenth of the month Daisios all mankind shall be destroyed by a flood. He commands him to bury the writings containing the records of the history of his country at Sippara, city of the dead, then to build a vessel, to stock it with provisions, then to embark with his family and his friends, also to take quadrupeds and birds with him.

Xisuthros obeys the command. The Flood occurs and covers the land; it decreases; he lets out birds to gain knowledge of the state of things, and finally leaves the ship and prepares with his family, an offering to the gods. Xisuthros is then, for his piety, translated to live among the gods, with his wife, his daughter and the steersman. Of the ship of Xisuthros, which finally stranded in Armenia, there still remains a portion in the Cordyaian Mountains in Armenia, and the people scrape off the bitumen with which it is covered, and use it as an amulet against sickness. And as the others had returned to Babylon and had found the writings at Sippara they built towns and erected temples, and so Babylon was again peopled.

Twenty years ago George Smith excavated and translated the inscribed tiles of the library of Asurbanipal, King of Assyria, 670 B. C., who, at the time of the founding of Greece, was gathering copies of the sacred writings of the ancient cities of Asia. The historical books of this library carry the annals of the Babylonians back 3800 B. C., but contain no certain account of any flood. How remote must then have been the great catastrophe which had filtered down in tradition and become embalmed in sacred myth and stately poem before the dawn of history! I present here, after the latest translations of Haupt and Jensen,* the last but one of the cantos of the *Gilgames Epic*, corresponding to the eleventh sign of the zodiac, Aquarius (or month of the curse of rain), containing the story of the Flood.

Gilgames (= Nimrod), the hero of Urruh, leaves his native town sick and troubled by the death of his friend Eabani, and visits his ancestor Samasnapisthim (= Xisuthros) called Hasisadra (= the devout wise man). Hasisadra spoke to him, to Gilgames, "I will make known unto thee, O Gilgames, the hidden story, and the oracle of the gods I will reveal to thee. The city of Shuripak, —the city which, as thou knoweth, lies on the bank of the river Euphrates—this city was already of high antiquity when the gods within set their hearts to bring on a flood storm (or deluge). Even the great gods who were there: their Father Anu; their councillor, the warlike Bel; their throne-bearer, Adar; their prince, Ennugi. But the Lord of unfathomable wisdom, the god Ea (the god of the sea), sat alone with them in council, and announced their intention unto the field, saying, Field! Field! town! town! field! hear! town; give attention, O man of Shurippak, son of Ubara-Tutu (The

splendor of the Sunset, Lenarmont, Sayce). Destroy thy house, build a ship, save all living beings which thou canst find. Withdraw from what is doomed to destruction. Save thy life and bid the seed of life of every kind mount into the ship.

"The vessel which thou shalt build, 600 half cubits in length, shall be her shape, and 120 half cubits the dimensions for both her width and depth. Into the sea launch her. When I understood this, I spake unto the god Ea—My lord thy command which thou hast thus commanded, I will regard it, I will perform it, but what shall I answer the city, the people, the elders? (The young men and the elders would ridicule me.)

"The god Ea opened his mouth and spake unto me, his servant: 'And thou shalt thus say unto them, "I know the god Bel (the god of Shurippak) is hostile to me, so I cannot remain in (the city); on Bel's ground I will not rest my head. I will sail into the deep sea; with the god Ea, my lord, I will dwell." But upon you there will pour down a mass of water. Men, fowl, and beast will perish, the fish only will escape. * * * And when the sun will bring on the appointed time Kukki will say, "In the evening the heavens will pour down upon you destruction."

"Then, however, close not thy door until the time comes that I send thee tidings. Then enter through the door of the ship, and bring into its interior thy food, thy wealth, thy family, thy slaves, thy maidservants and thy kindred. The cattle of the field, the wild beasts of the plains * * * will I send you, that thy gates may preserve them all.'

"Hasisadra opened his mouth and spake. He said to Ea, his lord: 'No one has ever built a ship in this wise on the land. However, I will see to it, and build the ship upon the land, as thou hast commanded.' (The description of the building of the vessel very partial.) I built the ship in six

* Haupt: in *Die Ansicht der Erde*. The first part from a later translation; Johns Hopkins' Circulars (VII., No. 69, p. 17), P. Jensen in Dr. Carl Schmidt, *Das Naturereignis der Sintflut*.

stories. I saw the fissures, and added that which was lacking. Three sars of bitumen I poured upon the outside, three sars of bitumen I poured upon the inside. (Thirteen lines of description illegible.) The vessel was finished. All that I had I brought together, all that I had in silver I brought together. All that I had of gold I brought together. All that I had in living seed I brought together. And I brought all this up into the ship, all my manservants and my maidservants, the cattle of the field, the wild beast of the plain, and all my kindred, I bade embark.

"As now the sun had brought on the appointed time, a voice spake: 'In the evening the heavens will rain destruction. Enter into the interior of the ship and shut the door. The appointed time is come.' The voice said, 'in the evening the heavens will rain destruction.' With dread I looked forward to the going down of the sun. On the day appointed for embarking I feared (greatly). Yet I entered into the interior of the ship and shut to my door behind me to close the ship. To Buzurbil, the steersman, I gave over the great structure with its load. Then arose Museri-ina-namari from the foundations of the heavens; a black cloud, in whose middle Ramman (the weather-god) let his thunder roar, while Neba and Sarru rush at each other in warfare.

"The Throne-bearers stalk over mountain and land,
The mighty god of pestilence let loose the whirl-
winds (?)

Adar lets the canals overflow unceasingly.
The Anunnaki raise their torches,
They make the earth glow with their radiant gleams.
Ramman's inundating wave rises up to heaven,
All light sinks in darkness.

In a day they lay waste the earth like a plague, the
winds raging blow.

Mountain high they bring the waters to fight against
mankind.

The brother sees the brother no more,
Men care no more for one another.
In heaven the gods fear the deluge and seek refuge.
They mount up to the heavens of the god Anu.

Like a dog in its lair the gods crouch at the windows
of heaven.

Istar (the mother of mankind) cries like a woman in
childbirth,

The sweet-voiced queen of the gods cries with loud
voice :

'The dwelling place of mankind is reduced to slime.
That has come which I announced before the gods as
an approaching evil.

I have announced the evil before the gods,
The war of destruction against my children have I
announced.

That which I brought forth, where is it. It fills the
sea like fish-spawn.'

Then the Gods wept with her over the doings of the
Anunnaki.

They pressed their lips together.

"Six days and six nights the wind and the deluge and the storm prevailed. At the opening of the seventh day, however, the storm lessened, the hurricane, which had waged a warfare like a mighty army, was appeased, and storm and deluge ceased. I sailed the sea mourning that the dwelling-places of mankind were changed to slime. Like logs the bodies floated around. I had opened a window, and as the light of day fell upon my face I shuddered and sat down weeping. My tears flowed over my face. Wherever I looked was a fearful sea. In all directions there was no land. Helpless the ship drifted into the region of Nizir. There a mountain in the land Nizir held the ship stranded, and did not allow it to advance farther toward the heights. On the first and second day the mountain of Nizir held the ship. Also on the third and the fourth day the mountain of Nizir held the ship. Even so on the fifth and the sixth day the mountain of Nizir held the ship. At the approach of the seventh day I loosened a dove and caused it to go forth. The dove went, it turned, and it found not a place where to rest, and it returned. I loosened and I caused to go forth a swallow. It went, it turned, and it found not a place where to rest, and it returned. I loosened and I caused to go forth a raven. The

raven flew off, and as it saw that the water had fallen it turned back. It waded in the water, but it returned not.

"Then I caused all to go forth to the four winds, and made a sacrifice. I erected an altar on the peak of the mountain. I disposed of the measured vases, seven by seven; beneath them I spread seeds—cedar and juniper. The gods smelled the odor. The gods smelled the good odor. The gods gathered like flies above the master of the sacrifice. From afar then the goddess Istar at her approach raised the great bows that Anu has made as their glory. She said, 'By the ornaments of my neck never will I forget. These days will I remember and never will I forget them forever. May the gods come to my altar. Bel shall never come to my altar, because he has not controlled himself, and because he made the deluge, and my people he has given over to destruction.'

"Bel also, at his approach, saw the vessel from afar. Bel stood still; he was full of anger against the gods and the god-like ones.

"What soul has then escaped?

"Never shall man survive the destruction.

"Adar opened his mouth and he spake. He said to the warrior Bel:

"Who, also, if it be not Ea, can have planned this? And Ea knew and has informed him.' Ea opened his mouth and spake. He said to the warrior Bel: 'Thou herald of the gods, warrior, why hast thou not controlled thyself; why hast thou made the deluge? Visit upon the sinner his sin, upon the blasphemer his blasphemy. Be persuaded not to destroy him. Be merciful that he be not destroyed. Instead that thou shouldst make a deluge, let the lions come, and let them cut off men. Instead that thou shouldst make a deluge, let the hyenas come, and let them devour men. Instead that thou shouldst make a deluge,

let the famine come and destroy the land. Instead that thou shouldst make the deluge, let the god of pestilence come and destroy the land. I have not disclosed the decision of the great gods. Hasisadra has interpreted a dream, and has understood the decision of the god.' Then Bel came to a better mind. He mounted to the interior of the vessel; he took my hand and made me to rise; myself made he to rise. He made my wife to stand up, and put her hand in mine; he turned around to us and blessed us.

"Hitherto Hasisadra was mortal, and behold, now, Hasisadra and his wife are lifted up to the gods. He shall dwell far away at the mouths of the rivers.'

"They took me, and in a secluded place at the mouths of the rivers they made me abide."

Surippak, the home of the wise man, on the banks of the Euphrates, of high authority before the deluge, is the same as Sippara, where Xisuthros (= Hasisadra), according to Berosus, buried the holy writings before the flood. Its ruins have been found in the Hill of Abu-Habba, about half-way between Babylon (now Hilleh) and Bagdad.*

It was 'at the mouths of the rivers;' that is, in time of the poem, the Euphrates and the Tigris emptied separately into the Persian Gulf. Now the Schat el Arab, formed by the union of the two streams, empties into the gulf, perhaps 400 kilometers below the site of the ancient city, across a delta so low and flat that the tide runs up 300 kilometers, and at Old Ninevah the elevation is only 300 m. Delitsch† has collected the evidence that the two streams once flowed separately into the gulf. Pliny says that almost nowhere does the formation of land by a stream advance so rapidly as here. He mentions a

* Carl Schmidt, loc. cit., p. 20.

† Wo lag das Paradies.

town, Alexandria-Antiochia, which, in the third century B. C., was about 1,600 m. from the sea, and had its own harbor, and 300 years later was 33 kilometers inland. Other historical documents make it probable that the streams were separate 150 years B. C. Rawlinson says that the delta advanced 3.2 kilometers in 60 years. All the attendant circumstances accord with this location of the story. Here, among a maritime people, as connoisseurs, they ridicule the building of a ship on the land. Ea is the goddess of the sea. And it is marvellous that this trait of the original is preserved in the Koran, where the story is told at length: "And he made the ark, and as often as the elders of his people came by him they ridiculed him, and he said, 'If you rail at us, be sure that we shall also rail at you as you rail at us.'"*

From the time of Moses and the Tower of Babel, pitch or bitumen had been much used in the Euphrates valley, where the Tertiary marls produced it abundantly. In Genesis xi. 3, it says of the Tower of Babel, "slime had they for mortar," and a primitive folk still pitches its boats inside and out on the waters of the Euphrates.

Thus the starting-point of the ark is well ascertained, and its landing-place can also be quite clearly located. It was in the land of Nizir, says the record. The Mesopotamian lowland is a narrow, northward extension of the Persian Gulf, between the Arabian plateau on the west and the Zagros Mountains, the scarp of the Persian highlands, on the east. An inscription of Asurnacir-pal, from the same library, reads: "Left Kalzu (by Arbela) and entered the region of the town of Babite, and approached the land Nizir." This is the account of a military expedition, and it followed up the great war road, by which, 500 years later, Darius Codomanus fled from the armies of Alexander. The region of

Nizir was east of the Tigris, at the foot of the Zagros chain, 300 feet above the sea, and the craft of Hasisadra must have been swept 160 miles northeast, and stranded in the foothills on the valley border.

Early accounts placed this landing on Mount Judi, in southern Armenia, where a temple in its honor was built in 776 A. D. Berosus places it in the Cordyaeian Mountains of Armenia, Genesis in Mt. Ararat (Araxes). It is remarkable how the tradition had clung to this grand volcano. The people still tell of the wood and pitch being carried from the ark as amulets, and dare not attempt to ascend the sacred mountain, and disbelieve the accounts of those few foreigners who have reached the summit. Indeed, a Constantinople newspaper account of a scientific commission sent out by the Turkish government in 1887, to study the avalanches in the mountain, tells of the finding of the ark, encased in the ice of a glacier on the mountain.

We may contrast the Chaldæan and Biblical accounts in several matters. The sending out of the birds and the bow in the heavens join with many other points to prove the identity of the stories.

In many ways the Biblical account is modified to suit the comprehension of an inland folk. While the Gilgames epic describes a violent hurricane and inundation, which expended its force in six days, the Biblical account describes a long-continued rain of forty days, or, in the Elohist document, of one hundred and fifty days. "And the waters were dried up from off the earth, and the face of the ground was dry." In the epic the forests were destroyed, and the face of the earth reduced to slime.

Waters rising from great rains would have swept the ship down the valley, while the epic makes it go from the gulf northeast to the region of Nizir. And, indeed, what seems the better translation of the Noachian account agrees with this. Gen.

* Koran, XI., 40, 41.

vi. 17, "I do bring a flood of waters" is better translated "I do bring a flood from the sea," and Gen. vii. 6, "Noah was six hundred years old as the flood of waters" (or better, 'from the sea') "arose."* As Amos says, writing 'two years after the earthquake.'† "Seek him that maketh the day dark with night, that calleth forth waters of the sea, and poureth them out upon the face of the earth."‡

We may now try to strip the account of its abundant personification, and see how far it is susceptible of a possible or probable translation into scientific language.

There are, first, the warnings. Hasisatra, the wise man, and, we may assume, wise in the ways of the sea, stands on the shore of the ancient harbor-town, Surippak, and receives the warnings of Ea, goddess of the sea. These were the unusual swellings of the sea from small premonitory earthquake shocks beneath the waters. There is next added a voice, or noise, a more unusual warning, not personified. This may have been the rumbling which may precede any severe earthquake. It is a region where earthquakes are antecedently probable. From the circle of fire that surrounds the Pacific, a zone of seismic activity connects the East and West Indies by way of the Mediterranean, and passes this region. The volcanic area of northern Mesopotamia and Syria is in seismic activity much of the time. Many towns have been several times destroyed and hundreds of thousands of people have been killed. And the recently sunken areas of 'Lemuria' to the south indicate a region of profound faulting apt for the production of earthquakes.

In the Ægean the sinking of the great land blocks by which the sea was formed is so recent that it is embalmed in the

Greek mythology; Poseidon, god of the sea, ever warring victorious against the gods of the land. And, though rarely noted on the lower Euphrates, earthquakes and seaquakes, as the Germans say, are not rare across the northern parts of the Indian Ocean; the wise man accepts this warning of impending danger and builds a great craft for the safety of his home, and with the increase of the threatenings embarks his family, regardless of the ridicule of the townsfolk.

"Then arose from the foundations of the heavens a black cloud, in whose middle Ramman (the god of storms) lets his thunders roar, while Neba and Sarru rush at each other in battle. The throne-bearers stalk over mountain and plain." These latter are the great slow-moving sand columns (whirlwinds) which precede and hang on the borders of the coming storm. They still occur around Bagdad, change day into night, and extend over the whole valley of the Euphrates. "The mighty god of pestilence lets loose his hurricanes." So far it is the description of the oncoming of a mighty storm. Then follow elements which may be interpreted as earthquake phenomena. The Biblical account says the foundations of the great deep were broken up, and at the end they were stopped. This may be explained as the uprush of the ground waters, so marked at Charleston and New Madrid, on the Indus plain, at Lake Baikal, where a lake ten by fifteen miles was formed, and in the delta of the river Selenga, when the fastenings of the wells were blown into the air like the corks of bottles. "The Annuniki raise their torches; they make the land glow with their radiant gleams." The Annuniki are the gods of the underground, the gnomes or kobolds of German saga, and their raising their torches is the inflaming of the natural gases, so common in these bituminous Tertiary beds, in the fissures opened by the

* J. D. Michaelis (Bunsen); majim = water, mijam = from the sea.

† Amos, i., 1.

‡ Amos, v., 8.

earthquake—a frequent occurrence also in similar regions on the Caspian.

In the earlier translation by Haupt the suggestions of earthquake intervention were even more striking than in the later translations. "Adar lets the canals overflow unceasingly. The Annuniki bring floods from the depths. They make the earth tremble by their might." Although hurricane inundations have overwhelmed great areas of land, the earthquake wave is in many ways a mere probable agency here for the production of a flood, exceptional as this must have been to have impressed itself so deeply on this ancient folk. We recall the Lisbon earthquake wave; how the United States warship *Monongahela* was carried ashore in 1863, at Santa Cruz, and landed on the tops of the houses; or how the great seismic wave of 1868 carried the *Waterloo* in the harbor of Arica, Peru, seven or eight miles inland, landing her in a tropical forest, where she ended her days as a hotel, while her consort, the *Fredonia*, rolled over and over, and sank with all on board; or the last terrible earthquake waves in Japan and China.

The account then advances strongly to its climax and catastrophe. "Ramman's flood-wave mounts up to heaven." All light sinks in darkness. Terror overcomes gods and men. "Like dogs in their lair the gods crouch at the windows of heaven." This is the description of the incoming of the great cyclonic waves, perhaps reinforced by earthquake waves, for when the seismic tension has just come to equal the resistance the great additional strain caused by the relief of pressure of the low barometer of the cyclone has not infrequently set loose the impending earthquake. Of 64 hurricanes in the Antilles 7 were accompanied by earthquakes. In the Bay of Bengal the cyclones average one a year and destroy a million people in a century; and once at Calcutta, in 1737, when the waters rose 40

feet, 14 ships were carried over the trees and 300,000 people were killed; and on the Kistna in 1800 the cyclone and the earthquake occurred together. Indeed, several of these cyclones have been traced across into the Persian Gulf, and one in 1769 was accompanied by an earthquake on the lower Euphrates—the very site of the ancient myth. On the broad plains of the Punjab are many indications of similar inundations. I travelled, said Ibn Batuta (1333), through Sind to the town Sahari, on the coast of the Indian Sea, where the Indus joins it. A few miles from here are the ruins of another town, in which stones in the form of men and animals in almost innumerable amount occur. The people were so sinful that God changed them to stone and their animals and their grain. It is interesting to observe the different effects these disturbing events have upon people of different grades of culture.

The Negritos of the Andaman Islands have a demon of the land who causes the earthquakes, a demon of the sea who causes the floods.

The King of Dahomey in 1862 had received the missionaries in the land. The spirit of his fathers shakes the earth because old observances were not followed. The King executes three captive chiefs as an envoy to inform his fathers that the ancient rites shall be re-established.

After the great earthquake of Kioto and Osaka in Japan, in 1596, the warrior Hidyoshi goes to the temple of Daibutsu (the Buddha), where the enormous bronze statue had been overthrown, and upbraids the fallen idol and shoots it with arrows.

In 62 A. D. Oppolonius of Tyana, at Phæstus, in Crete, was preaching to a company of worshippers of the local deity, when an earthquake arose. "Peace," he said, "the sea has brought forth a new land." An island was found between Thera and Crete, Santorin, beloved of all geologists in modern

times. The crowd loses all judgment in wonder and admiration.

A true flood panic occurred in the time of Charlemagne. Stöffler, a celebrated astronomer and professor of mathematics at Tübingen, found, as the result of abstruse calculation, that the earth would be destroyed by a flood in 1524. The news spread rapidly and filled Europe with alarm. In Toulouse an ark was built by advice of the professor of canonical law to rescue at least a part of the people. Indeed, in our own days, Prof. Rudolph Falb and similar prophets announce a new flood in the year A. D. 7132.* And Falb has by his unverified earthquake predictions caused panics in Athens and Valparaiso.

It is the western migration of this ancient story that is noteworthy, and its association with the punishment of sin by the religious genius of the Hebrews which has made it world-wide. Such myths of observation, dependent on local floods or the suggestion of fossils, are most widely spread, and they find place in cosmogonic myths—explanations of the origin of land and sea; national myths—explanations of the origin of peoples; and myths of destruction of land or people, with or without the idea of punishment for sin.

They are wanting among the Africans and in Australia and Oceania according to Lenormant; more accurately among the Papuans of Oceania, for the Feejee Islanders kept great canoes on the hill-tops for refuge when the flood should return.

In China the great Cyclopedia (2357 B. C.) says: "The waters of the flood are destructive in their inundation. In their wide extent they surround the mountains, overtop the hills, threaten the heaven with their waters, so that the common folk is dissatisfied and complains. Where is the able man who will undertake to control the evil. Kwan tries nine years, Yu eight

* Schmidt, loc. cit., p. 61.

years. He completes great works, cuts away woods, controls the streams, dykes them and opens out their mouths. He feeds the people."

This refers to the 'Curse of China,' the Yang-ze-Kiang, which flows sometimes into the Gulf of Pechili north of the promontory of Shantung, sometimes to the south of the Yellow Sea.

Our own Indians gave Catlin 160 flood myths. The dog of the Cherokees is well known. On Cundinamarca in Mexico there were four destructions: of famine, personified by giants; of fire, by birds; of wind, by monkeys; of water, by fishes.

The Quichés of Guatemala say: As the gods had created animals who do not speak or worship the gods and had made men from clay who could not turn their heads—who could speak indeed, but not understand anything—they destroyed their imperfect work by a flood.

A second race of mankind was created, the male of wood, the woman of resin, but it was not thankful to the gods. The gods rained burning pitch on the earth, and sent an earthquake, destroying all but a few, who became monkeys. A third attempt succeeded so well that the gods themselves were terrified at the perfection of their work, and took from them some of their good qualities, and the normal man resulted.*

The Arawaks of British Guiana and Venezuela were for their sins twice destroyed—once by flood, and once by fire, and only the good and wise were saved.

The flood is a perennial blessing in Egypt, and when the Greeks told the priests of the deluge of Deucalion they said, 'Egypt has been spared this.'

There is an inscription on the walls of the tomb of Seti-on, in Thebes, 1350 B. C. The sun-god, Ra, is wroth with mankind, and the council of the gods decree its doom. Hathor, queen of the gods, does the work,

* Schmidt, 'Sintflut,' 57.

till all the land is flooded with blood. She sees the fields flooded with blood, she drinks thereof; her soul is glad; she does not know mankind. Only those who, at the right time, fix their thoughts above are spared, and of these the Majesty of Ra says: 'These are the good.'

In Persia there are no flood myths preserved before time of Zoroaster.

In India, where the flood is a constant scourge, the four Yugas (ages) and the four Manvartaras, the alternate destructions and renewals of the human race, are Vedic myths, and no trace of the flood story appears in the Vedas. The Sata-patha-Bramahna, written just before the time of Christ, is especially interesting, from the blending of the Chaldean account with the Indian mythology. In this oldest account the flood came from the sea, the warning and the rescue of Manu, the Indian Noah, from Vishnu, in form of a fish. Here all the suggestion may be indigenous. There is no punishment.

In the Mahabharata the ship lands on the highest peak of the Himalaya. In the last part of the story, in the Bhagarata Purana, the motive of the flood is that the wickedness of man was great in the earth. Vishnu, in the form of a fish, warns Manu Satjavrata, the well-doer (Ea was a fish-god in the Chaldean story, and Oannu, in Berosus, was a fish-god), that in seven days the three worlds will sink in an ocean of death, but in the midst of the waves a ship will be provided for Manu. He is to bring all useful plants and a pair of all irrational animals into the ship. The sea rose over its banks and overwhelmed the earth. Violent wind and cloudburst from measureless clouds contributed to the flood. Vishnu, in form of a gold-gleaming fish, guided the ship. Before the flood the holy Vedas were stolen, afterwards they were restored by Vishnu.

In Greece, also, as the sinking of the land has persisted to greater extent into the

most modern times, so the flood-myths have there greater variety and definiteness than elsewhere, and later the Chaldean account was grafted on to the earlier with greater fulness. The story is not known to Hesiod in the 'Works and Days' (8th century B. C.), though he enumerates several destructions of the sinful race of man, and the 'Iliad' mentions destructive cloudbursts as the usual punishment of heaven on the unjust judge.

Thus, in the Boeotian myth Ogyges, it is significant that Ogyges was son of Poseidon, god of the sea, and I have heard the name itself derived from an Aryan root, meaning a flood. Ogyges is rescued in a boat.

The story of Deucalion's flood is first given in the Hesiodic catalogues, 800 to 600 B. C. Pyrrha and Deucalion were alone rescued in a ship. As told in an archaic form by Pindar* (500 B. C.), 'Pyrrha and Deucalion, coming down together from Parnassus, founded their mansion first, and, without marriage union, produced the strong race of the same stock, and hence they were called Laioi from a word meaning stones, as they threw stones over their heads to form the first men.

Apollodorus (100 B. C.) shows the first influence of the Semitic myth. He extends the flood over almost all Greece, and says Deucalion offered sacrifice on leaving the ship. Later, the ark, the taking-in of animals and sending-out of birds, appear in the Greek myth, and Lucian, or pseudo-Lucian, in "De Dea Syria" (160 A. D.), in a chapter on Hydrophoria, narrates an Armenian flood-myth, which had its home in the upper Euphrates, at Hierapolis, the modern Mambedj, and blends the Hellenic and Semitic story. "The most say that Deucalion Sysythes built the sanctuary, that Deucalion under whom the great deluge occurred. Of Deucalion I heard also in Hellas the story which the Hellenes

* Olympics, IX., 4 (500 B. C.)

tell of him, which runs as follows: The first men had grown very wicked upon the earth, and, in punishment, suffered a great evil. The earth sent up from its bosom mighty masses of water. Heavy rains followed, the rivers swelled, and the sea overflowed the land, until all was covered with water, and all were destroyed; only Deucalion, of all mankind, remained alive. He had built a box or ark, and his family, as also pairs of all kinds of animals, entered into it. All sailed in the ark as long as the waters continued. So the Hellenes write of Deucalion. To this the inhabitants of the holy town add a very strange story; that in their land a great fissure opened in the earth, and this received all the water. Deucalion built altars after this happened, and by the opening built a temple to Here. I saw the opening. It is under the temple, and is very small. As a sign and remembrance of this story, they do as follows: Twice a year water is brought to the temple from the sea. Not alone do the priests bring this; out of all Syria and Arabia, India, and from beyond the Euphrates many go down to the sea, and all bring water. They pour it out in the temple, and it flows into the fissure, and the small opening receives a great quantity of water. And this ceremony, they say, Deucalion appointed in the temple in remembrance of the catastrophe and his rescue. A statue of Here is in the temple, and another god, which, although it is Zeus, they call by another name. Between the two stands a golden column. The Assyrians call it the sign, give it no special name, and cannot explain its origin or its form. Some refer it to Dionysus, others to Deucalion, others to Semiramis. There is on its top a golden dove. Therefore, it is said to represent Semiramis. Twice a year it is taken to the sea to bring water, as described above." There were similar Hydrophoria at Athens.

AMHERST COLLEGE.

B. K. EMERSON.

SECTION A—MATHEMATICS AND ASTRONOMY.

THE Vice-Presidential address before Section A was necessarily omitted, as illness in his family had prevented Prof. Story from preparing an address and from attending the meeting.

The vacancy in the chair was filled by the election, by the Association, of Prof. Alexander Macfarlane as Vice-President for the Section.

The following papers were presented before the Section, in number one less than were read at the Springfield meeting last year.

An Analog to De Moivre's Theorem in a Plane Point System: By E. W. HYDE.

Three points, e_0, e_1, e_2 , at the vertices of an equilateral triangle, are taken as a reference system, and an operator ω is assumed such that

$$\omega e_0 = e_1, \omega^2 e_0 = \omega e_1 = e_2, \omega^3 e_0 = \omega^2 e_1 = \omega e_2 = e_0.$$

Then the action of the general operator

$$x_0 + x_1 \omega + x_2 \omega^2,$$

in which x_0, \dots, x_2 are scalars, is discussed. The x 's are shown to be functions of a scalar n and an angle θ , designated as $K(n, \theta)$, such that

$$[K_0(n, \theta) + \omega K_1(n, \theta) + \omega^2 K_2(n, \theta)]^k \\ = K_0(n^k, k\theta) + \omega K_1(n^k, k\theta) + \omega^2 K_2(n^k, k\theta),$$

which is the analog of De Moivre's theorem. Addition-multiplication theorems for the K -functions are found, and a trigonometry of them developed.

Rational Scalene Triangles: By ARTEMUS MARTIN; read by the Secretary.

In this paper, which will appear in the *Mathematical Magazine*, formulæ are given for calculating the sides of rational triangles, with numerous illustrative examples.

New elements of the variable R Comæ, resulting from observation in July and August, 1896, and

Photometric Observations of Colored Stars: By HENRY M. PARKHURST.